QUARTERLY JOURNAL

OF THE

Royal Meteorological Society

Editor :

R. C. SUTCLIFFE

Vol. **98**, 1972

ROYAL METEOROLOGICAL SOCIETY
CROMWELL HOUSE, HIGH STREET, BRACKNELL, BERKS.
1972

CONTENTS OF VOLUME 98

J. R. Bates—Tropical disturbances and the general circulation—Napier Shaw Memorial Prize, 1971 1

J. J. Barnett, M. J. Cross, R. S. Harwood, J. T. Houghton, C. G. Morgan, G. E. Peckham, C. D. Rodgers, S. D. Smith and E. J. Williamson—The first year of the selective chopper radiometer on Nimbus 4 17

M. E. Hardman, D. G. James and P. Goldsmith—The measurement of mesoscale vertical motions in the atmosphere 38

S. Hastenrath—Daily wind, pressure, and temperature variation up to 30 km over the tropical western Pacific 48

R. I. Sax and P. Goldsmith—Nucleation of water drops by Brownian contact with AgI and other aerosols 60

J. R. Starr and K. A. Browning—Observations of lee waves by high-power radar .. 73

C. Finizio, S. Palmieri and A. Riccucci—A numerical model of the Adriatic for the prediction of high tides at Venice 86

S. C. Mossop, R. E. Cottis and B. M. Bartlett—Ice crystals concentration in cumulus and stratocumulus clouds 105

A. S. Thom—Momentum, mass and heat exchange of vegetation 124

J. D. Woods, J. C. Drake and P. Goldsmith—Coalescence in a turbulent cloud .. 135

J. T. Bartlett and P. R. Jonas—On the dispersion of the sizes of droplets growing by condensation in turbulent clouds 150

M. E. McIntyre—Baroclinic instability of an idealized model of the polar night jet .. 165

J. Warner—The structure and intensity of turbulence in air over the sea 175

Shorter Contributions—

A. W. Brewer and K. P. B. Thomson—A radiometer-sonde for observing stratospheric emission due to water vapour in its rotational band 187

K. O. L. F. Jayaweera and B. F. Ryan—Terminal velocities of ice crystals 193

R. J. Polavarapu—Direct measurement of vapour pressure and its fluctuations using fine thermocouples 198

A. J. Dyer and B. B. Hicks—The spatial variability of eddy fluxes in the constant flux layer 206

F. Fiedler and H. A. Panofsky—The geostrophic drag coefficient and the 'effective' roughness length 213

I. Dodds—The surface drag contribution to the depth of Atlantic, and European, depressions 221

Correspondence—

W. C. Macklin, M. Majoube and L. Merlivat—The isotopic analysis of hailstones .. 226

B. Ingham—A note on 'New lag associations between North Atlantic sea temperature and European pressure applied to long-range weather forecasting' by R. A. S. Ratcliffe and R. Murray: Reply by R. A. S. Ratcliffe 227

R. Dixon—The equation of a wind satisfying the balance equation 229

Discussions—

K. Ya. Kondratyev and G. A. Nikolsky—Solar radiation and solar activity (*Q.J.*, **96**, p. 509) 231

R. H. Clarke—Observational studies in the atmospheric boundary layer (*Q.J.*, **96**, p. 91) 231

P. J. Everson and D. R. Davies—On the use of a simple two-level model in general circulation studies (*Q.J.*, **96**, p. 404): A note on the dependence of atmospheric predictability on baroclinic development (*Q.J.*, **97**, p. 238) 236

Proceedings at meetings of the Society 239

Reviews—

Annual review of fluid mechanics, Volume 3, Annual Reviews Inc.(P.R.O.); *Annual Report on the Meteorological Office* 1970, H.M.S.O. (J.R.M.); *Biometeorological methods*, R. E. Munn (J.R.M.); *Scientific papers of Sir Geoffrey Ingram Taylor, Volume* 4, G. K. Batchelor (Ed.) (R.H.); *Atmosphere, weather and climate*, R. G. Barry and R. J. Chorley (R.C.S.); *Advances in geophysics, Volume* 14 *Precision radiometry*, A. J. Drummond (Ed.) (J.T.H.); *Techniques d'etude des facteurs de la biosphère*, I.N.R.A. (H.L.P.) 242

H. A. Douglas, R. Hide and P. J. Mason—An investigation of the structure of baroclinic waves using three-level streak photography 247

S. P. S. Arya—The critical condition for the maintenance of turbulence in stratified flows 264

J. Findlater—Aerial explorations of the low-level cross-equatorial current over eastern Africa 274

P. R. Rowntree—The influence of tropical east Pacific Ocean temperatures on the atmosphere 290

K. Fraedrich—A simple climatological model of the dynamics and energetics of the nocturnal circulation at Lake Victoria 322

M. W. Moncrieff and J. S. A. Green—The propagation and transfer properties of steady convective overturning in shear 336

B. W. Atkinson and P. A. Smithson—An investigation into meso-scale precipitation distributions in a warm sector depression 353

A. N. Aufdermaur and D. A. Johnson—Charge separation due to riming in an electric field 369

G. A. McBean and M. Miyake—Turbulent transfer mechanisms in the atmospheric surface layer 383

Shorter Contributions—

S. B. Idso—Systematic deviations of clear sky atmospheric thermal radiation from predictions of empirical formulae 399

E. C. Kung—A scheme for kinematic estimate of large-scale vertical motion with an upper-air network 402

P. J. Everson and D. R. Davies—Ekman boundary layer interactions in a numerical model of the general circulation 412

D. N. Axford—A case study of a high level Canberra flight on 11 September 1968 .. 420

S. D. Smith, M. J. Colles and G. Peckham—The measurement of surface pressure from a satellite 431

P. R. Brazier-Smith—The stability of charged drops in uniform electric fields .. 434

H. C. Martin—Humidity and temperature microstructure near the ground 440

Discussion Meeting, 17 November 1971 on ' The global atmospheric research programme GARP and the United Kingdom's participation '— 447

P. A. Sheppard—Development of ideas and organization

J. S. Sawyer—Present GARP plans

B. J. Mason—The GARP tropical experiment

R. C. Sutcliffe—Predictability and forecasting

H. Charnock—Air-sea interaction and the boundary layer

J. T. Houghton—Observational programme for the GARP Global experiment

G. A. Corby—Dynamic modelling for the GARP Global experiment: global modelling in the Meteorological Office

R. P. Pearce—Dynamic modelling for the GARP Global experiment: global modelling in the United Kingdom Universities

Correspondence—

S. P. S. Arya—' Comment on the paper by P. A. Taylor: ' A note on the log-linear velocity profile in stable conditions' '. Comment by H. Charnock: Reply by P. A. Taylor 460

Proceedings at meetings of the Society 464

Reviews—

Handbook of aviation meteorology, H.M.S.O. (D.H.M.); *Forecast for Overlord, June 6, 1944*, J. M. Stagg (R.C.S.); *The blizzard* of '91, Clive Carter (G.M.) 466

F. Pasquill—Some aspects of boundary layer description—Presidential Address .. 469

B. R. Bullock and D. R. Johnson—The generation of available potential energy by sensible heating in Southern Ocean cyclones 495

K. J. Weston—The dry-line of Northern India and its role in cumulonimbus convection 519

B. J. Hoskins—Non-Boussinesq effects and further development in a model of upper tropospheric frontogenesis 532

R. A. R. Tricker—Observations on certain features to be seen in a photograph of haloes taken by Dr. Emil Schulthess in Antarctica 542

J. C. Kaimal, J. C. Wyngaard, Y. Izumi and O. R. Coté—Spectral characteristics of surface-layer turbulence 563

J. C. Wyngaard and O. R. Coté—Cospectral similarity in the atmospheric surface layer 590

A. J. Illingworth—Electric field recovery after lightning as the response of the conducting atmosphere to a field change 604

R. H. Clarke—The vertical propagation of angular momentum in the west wind belts 617

P. A. Sheppard, D. T. Tribble and J. R. Garratt—Studies of turbulence in the surface layer over water (Lough Neagh). Part 1. Instrumentation, programme, profiles 627

J. R. Garratt—Studies of turbulence in the surface layer over water (Lough Neagh). Part II. Production and dissipation of velocity and temperature fluctuations 642

Shorter Contributions—

R. J. Taylor—Aircraft measurements of dissipation of turbulent kinetic energy .. 658

P. E. Francis—The possible use of Laguerre polynomials for representing the vertical structure of numerical models of the atmosphere 662

R. A. Hamilton and R. J. Shearman—Diurnal variation of temperature and wind in the equatorial stratosphere 668

V. Hisdal—Diurnal wind variations in Antarctica 673

Correspondence—

P. R. Jonas—The collision efficiency of small drops 681

Discussions—

E. C. Kung—A diagnosis of adiabatic production and destruction of kinetic energy by the meridional and zonal motions of the atmosphere (*Q.J.*, **97**, p. 61) 684

K. A. Browning—Structure of the atmosphere in the vicinity of large-amplitude Kelvin-Helmholtz billows (*Q.J.*, **97**, p. 283) 685

T. W. Harrold and K. A. Browning—Identification of preferred areas of shower development by means of high power radar (*Q.J.*, **97**, p. 330) 687

Report of the Council for 1971 689

Proceedings at meetings of the Society 703

Reviews—

The physics of clouds, B. J. Mason (P.G.); *Inadvertent climate modification: Report of the study of Man's impact on climate*, Sponsored by Massachusetts Institute of Technology (R.C.S.) 708

Obituary Notice 710

C. Junge—The cycle of atmospheric gases—natural and man made—Symons Lecture .. 711

A. J. Miller, J. A. Brown and K. A. Campana—A study of the energetics of an upper stratospheric warming (1969-1970) 730

N. Thompson—Turbulence measurements over the sea by a tethered-balloon technique 745

N. E. Davis—The variability of the onset of spring in Britain 763

M. H. Unsworth and J. L. Monteith—Aerosol and solar radiation in Britain .. 778

D. W. Parkin, D. R. Phillips, R. A. L. Sullivan and L. R. Johnson—Airborne dust collections down the Atlantic 798

G. A. Corby, A. Gilchrist and R. L. Newson—A general circulation model of the atmosphere suitable for long period integrations 809

Shorter Contributions—

R. P. W. Lewis—The estimation of ground-level pressure fields from computer analyses and their application to large-scale atmospheric mass transfer 833

B. B. Hicks and A. J. Dyer—The spectral density technique for the determination of eddy fluxes 838

H. A. Panofsky and E. L. Petersen—Wind profiles and change of terrain roughness at Risø 845

G. W. Smith—Inexpensive instruments for the measurement of solar radiation .. 855

Correspondence—

L. A. Mathews and D. L. Salt—Comments on a paper by T. L. Ogden and K. O. L. F. Jayaweera ' Drag coefficients of water droplets decelerating in air '; Reply by T. L. Ogden 860

Discussions—

B. J. Hoskins—Atmospheric frontogenesis models: some solutions (*Q.J.*, **97**, p. 139) .. 862

Proceedings at meetings of the Society 863

Reviews—

Atmosphere-ocean interaction, E. B. Kraus (F.P.); *The physical geography of the sea and its meteorology*, M. F. Maury (G.M.); *Physical geography: a systems approach*, R. J. Chorley and B. A. Kennedy (J.McC); *British rainfall* 1964, Meteorological Office (H.L.P.) 866

Index and Contents pages 869

NOTICE—The Royal Meteorological Society does not accept any responsibility for the views and opinions expressed by individual writers in the *Quarterly Journal*.